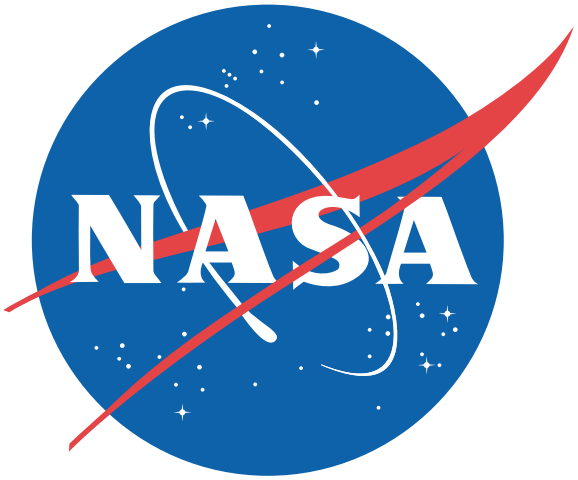

National Aeronautics and Space Administration

January 7, 2004

In Partnership with
Office of Biological and Environmental Research
U.S. Department of Energy
and
Cooperative State Research, Education, and Extension Service
U.S. Department of Agriculture

NRA-04-OES-01

RESEARCH ANNOUNCEMENT

CARBON CYCLE SCIENCE

Notice of Intent Deadline: February 11, 2004
Proposal Deadline: April 7, 2004

OMB Approval No. 2700-0087

CARBON CYCLE SCIENCE

NASA Research Announcement
Soliciting Research Proposals
for
Period Ending
April 7, 2004

NRA-04-OES-01
Issued January 7, 2004

Office of Earth Science
National Aeronautics and Space Administration
Washington, DC 20546

The National Aeronautics and Space Administration (NASA) announces the solicitation of proposals to participate in NASA Earth Science Enterprise (ESE) Carbon Cycle Science research and applications activities. NASA seeks proposals to improve understanding of changes in the distribution and cycling of carbon among the active land, ocean, and atmospheric reservoirs. Of special interest are the factors that affect changes in atmospheric carbon dioxide (CO_2) concentrations and the impact of such changes on carbon management.

The U.S. Department of Energy (DOE) and the Cooperative State Research, Education, and Extension Service (CSREES) of the U.S. Department of Agriculture (USDA) are collaborating with NASA in the North American Carbon Program (NACP) and in this solicitation. DOE plans to select proposals responding to this NASA Research Announcement (NRA) for funding through appropriate programs within the DOE Office of Biological and Environmental Research. CSREES will select proposals responding to this NRA for funding through the USDA National Research Initiative (NRI).

I. INTRODUCTION

The NASA vision is:
To improve life here
To extend life to there
To find life beyond

The NASA mission is:
To understand and protect our home planet
To explore the Universe and search for life
To inspire the next generation of explorers

…as only NASA can.

The Earth Science Enterprise is one of six NASA enterprises seeking to fulfill the agency's vision and carry out its mission (http://www.earth.nasa.gov/visions/index.html). The ESE mission is to understand and protect our home planet by using our view from space to study the Earth system and improve predictions of Earth system change. The ESE, working with its domestic and international partners, provides accurate, objective scientific data and analyses to advance our understanding of Earth system processes and to help policy makers and citizens achieve economic growth and effective, responsible stewardship of Earth's resources. The ESE research program aims to acquire deeper scientific understanding of the components of the Earth system, their interactions, and the consequences of changes in the Earth system for life. These interactions occur on a continuum of spatial and temporal scales ranging from short-term weather to long-term climate and motions of the solid Earth, and from local and regional to global.

The frontier of Earth system science is to: (1) explore interactions among the major components of the Earth system – continents, oceans, atmosphere, ice, and life, (2) distinguish natural from human-induced causes of change, and (3) understand and predict the consequences of change. NASA has established six scientific focus areas for these complex processes. These scientific focus areas are: Atmospheric Composition, Carbon Cycle and Ecosystems, Climate Variability

and Change, Earth Surface and Interior, Water and Energy Cycle, and Weather. Roadmaps have been developed to summarize the technology, observations, modeling, field campaigns, basic research, and partnerships needed over time to achieve the long-term goals for each of these focus areas (http://earth.nasa.gov/roadmaps/). The roadmap for the Carbon Cycle and Ecosystems focus area provides the strategic framework for research under this NRA. ESE focus areas are interrelated and must eventually be integrated to arrive at a fully interactive and realistic Earth system representation. The opportunities for research offered in this NRA fall within the Carbon Cycle and Ecosystems Focus Area, but there are strong interrelationships with other focus areas that must not be overlooked in research plans.

Five fundamental questions drive ESE research:

- How is the global Earth system changing?
- What are the primary causes of change in the Earth system?
- How does the Earth system respond to natural and human-induced changes?
- What are the consequences of change in the Earth system for human civilization?
- How will the Earth system change in the future?

These core questions represent a paradigm of forcing, response, and the processes that link these and maintain feedbacks within the Earth system. The topics called out by this NRA will help ESE to answer, either in full or in part, the following subset of the Enterprise's 24 second-tier research questions related to the Carbon Cycle and Ecosystems Focus Area:

- How are global ecosystems changing?
- What trends in atmospheric constituents and solar radiation are driving global climate?
- What changes are occurring in global land cover and land use, and what are their causes?
- How do ecosystems, land cover, and biogeochemical cycles respond to and affect global environmental change?
- What are the consequences of land cover and land use change for human societies and the sustainability of ecosystems?
- What are the consequences of climate change and increased human activities for coastal regions?
- How will carbon cycle dynamics and terrestrial and marine ecosystems change in the future?

In addition to scientific research on the carbon cycle, this NRA offers opportunities through the ESE Earth Science Applications Program (http://www.earth.nasa.gov/eseapps) to extend the use of observations, data products, Earth system model outputs, etc. derived by ESE sponsored missions and programs in order to address policy and management decisions undertaken by government agencies and other cognizant organizations to address national and international goals related to stabilization of emissions and to sequestration of carbon-based greenhouse gases. The ESE Earth science applications strategy focuses on understanding priority issues that face public and private decision makers and determining how the scientific and technical capabilities of ESE can address these issues. To accomplish its objectives, the Earth Science Applications

Division encourages partnerships with operational entities to benchmark enhancements to their existing and evolving decision making tools and systems and to incorporate ESE research results that improve the accuracy and timeliness of their decision-making processes.

Research supported by DOE's Office of Biological and Environmental Research is focused on the effects of energy production and use on the global Earth system, primarily through studies of climate response. Research includes climate modeling, atmospheric transport and chemistry, atmospheric properties and processes affecting the Earth's radiation balance, and sources and sinks of energy-related greenhouse gases, primarily CO_2. DOE operates the AmeriFlux network of CO_2 flux measurements to understand the dependence of CO_2 exchanges on environmental conditions and ecosystem processes and to test how well point measurements of net CO_2 exchange represent larger areas and allow estimates of carbon sources and sinks on a regional basis.

USDA supports studies to improve our understanding of the role of terrestrial systems in climate change and the potential effects of global change on food, fiber, and forestry production in agricultural, forest, and rangeland ecosystems. USDA research seeks to determine the significance of terrestrial systems in the global carbon cycle and to identify agricultural and forestry activities that can contribute toward reducing greenhouse gas concentrations. Within USDA, CSREES's mission is: To advance knowledge for agriculture, the environment, human health and well being, and communities. The purpose of CSREES's National Research Initiative is to support research, education, and extension grants that address key problems of national, regional, and multi-state importance in sustaining all components of agriculture.

II. GOALS AND BACKGROUND OF THIS NRA

This announcement offers opportunities for new and successor Carbon Cycle Science investigations within ESE, the DOE Office of Biological and Environmental Research, and the USDA Cooperative State Research, Education, and Extension Services National Research Initiative. This NRA is the opportunity to propose relevant projects that continue or extend research funded through NASA NRA-00-OES-08 (http://research.hq.nasa.gov/code_y/dynamic.cfm?op_fy=2001).

NASA, DOE, and USDA carbon cycle research contributes toward the goals of the U.S. Climate Change Science Program (CCSP) (http://www.usgcrp.gov/) and of the U.S. Climate Change Technology Program (CCTP) (http://www.climatetechnology.gov/) by providing critical scientific information about the movement of carbon in the environment and potential near- and long-term changes in the carbon cycle, including the role of and implications for societal actions. U.S. carbon cycle research addresses two broad questions:

- How large and variable are the dynamic reservoirs and fluxes of carbon within the Earth system, and how might carbon cycling change and be managed in future years, decades, and centuries?
- What are our options for managing carbon sources and sinks to achieve an appropriate balance of risk, cost, and benefit to society?

Currently, understanding and quantifying North America's carbon balance is a CCSP priority, expressed by the research question:

> What are the magnitudes and distributions of North American carbon sources and sinks on seasonal to centennial time scales, and what are the processes controlling their dynamics?

The North American Carbon Program (NACP) (http://www.esig.ucar.edu/nacp/index.html) will address this research question, and this NRA provides opportunities for NACP investigations of specific interest to NASA, DOE, and USDA-CSREES.

The dynamics of the global carbon cycle determine changes in atmospheric CO_2 concentrations and the evolution of carbon sources and sinks. Therefore, this NRA provides opportunities for global modeling and analysis incorporating carbon data assimilation using remote sensing observations. This NRA also requests proposals for investigations that take advantage of unique NASA capabilities to reduce major uncertainties about carbon cycle dynamics in regions outside of North America. Northern Eurasia is of particular interest as part of the Northern Eurasia Earth Science Partnership Initiative (NEESPI) (http://neespi.gsfc.nasa.gov/).

The Global Observation for Forest and Land Cover Dynamics (GOFC-GOLD) is a coordinated international effort working to provide ongoing space-based and *in situ* observations of forests and other vegetation for the sustainable management of terrestrial resources and to obtain an accurate, reliable, quantitative understanding of the terrestrial carbon budget (http://www.fao.org/gtos/gofc-gold/index.html). This NRA provides opportunities for studies to quantify terrestrial carbon budgets within the GOFC-GOLD framework through the use of space-based observations of forests and other vegetation, including investigations relevant to the NACP.

This NRA addresses topics of primary concern to the NASA-ESE's Carbon Cycle and Ecosystems Focus Area. There are, however, important linkages between carbon cycle science and research within ESE's other focus areas: Water and Energy Cycle, Atmospheric Composition, Climate Variability and Change, Weather, and Earth Surface and Interior. Investigators are encouraged to address critical linkages and to develop relationships between work proposed in response to this NRA and relevant research within other ESE focus areas. Explicit attention to linkages will be considered favorably in the evaluation of proposals with an otherwise strong carbon cycle emphasis in responding to this NRA.

The use of data from U.S. Earth-observing satellites is a high priority for NASA in this NRA. Satellites collecting data useful in carbon cycle research include Landsat, Earth Observing-1 (EO-1), Terra (MODIS, MISR, ASTER, MOPITT sensors), Aqua (MODIS, AIRS, and AMSR-E sensors), ICESat, and commercial satellites with high-spatial resolution sensors (http://gaia.hq.nasa.gov/ese_missions/ and http://eospso.gsfc.nasa.gov/index.php). The use of data from multiple sensors and the incorporation of observations into formal data assimilation schemes for carbon cycle analysis, forecasts, and predictions are a priority for NASA in this NRA.

III. CARBON CYCLE RESEARCH OPPORTUNITIES

This NRA solicits research proposals in four topical areas: (1) studies to be conducted as part of the North American Carbon Program (NACP), (2) global carbon cycle modeling and analysis focusing on use of remote sensing data, (3) regional studies outside of North America that provide critical understanding of and offer to reduce major uncertainties about the global carbon cycle, and (4) carbon management. NASA is interested in the effective use of satellite observations (e.g., Landsat, EO-1, Terra, Aqua, ICESat) to address these carbon cycle science topics. Proposals may address more than one topical area.

1. North American Carbon Program

NASA, DOE, and USDA-CSREES seek proposals for research contributing toward North American Carbon Program (NACP) (http://www.esig.ucar.edu/nacp/index.html) goals that match NASA, DOE, and USDA-CSREES missions. As explained in the NACP science plan, the goals of the program are to:

- Develop quantitative scientific knowledge, robust observations, and models to determine the emissions and uptake of CO_2, CH_4, and CO, changes in carbon stocks, and the factors regulating these processes for North America and adjacent ocean basins.
- Develop the scientific basis to implement full carbon accounting on regional and continental scales. This is the knowledge base needed to design monitoring programs for natural and managed CO_2 sinks and emissions of CH_4.
- Support long-term quantitative measurements of fluxes, sources, and sinks of atmospheric CO_2 and CH_4, and develop forecasts for future trends.

In this regard, NASA, DOE and USDA-CSREES request proposals to:

(1) Develop and analyze remote sensing data and products best suited to achieving the goals of the NACP;

(2) Develop methods for relating North American *in situ* marine and terrestrial observations, AmeriFlux, AgriFlux, and FLUXNET observations of net ecosystem carbon exchange, as well as inventory data to continental-scale remote sensing and modeling; and

(3) Contribute to NACP intensive field campaigns on or over the North American continent or in adjacent ocean basins using capabilities unique to NASA, DOE, or USDA-CSREES or in some combination.

NASA's primary interest is in research and applications to bring remote sensing to bear on NACP objectives. This interest includes the resolution of major temporal and spatial scaling issues and participation in field campaigns where remote sensing provides critical data or where field investigations are required for extended validation or interpretation of remote sensing data in the NACP context. DOE and USDA-CSREES are similarly interested in scaling problems inherent in NACP and in contributing to NACP intensive field campaigns.

The NACP is committed to reducing uncertainties related to the buildup of CO_2 and methane (CH_4) in the atmosphere and the fraction of fossil fuel carbon being taken up by North America's ecosystems and adjacent oceans. Therefore, studies contributing to NACP must pay particular

attention to quantifying and/or characterizing errors and uncertainties in their data products and results.

Remote sensing provides critical continental-scale observations for characterizing carbon stocks and fluxes within North America and adjacent coastal and oceanic waters. Satellite observations of phytoplankton biomass, marine primary productivity and new production, and oceanic carbon transport based on remote sensing of ocean color provide better understanding of the oceanic "biological pump," which plays a key role in the export of carbon from surface waters into the deep ocean. Comprehensive remote sensing observations, perhaps merged with other relevant data, that can be readily incorporated into carbon cycle models are a priority for this NRA. The emphasis must be on quantifying and understanding regional and continental carbon sources and sinks within North America and adjacent oceans.

Recognizing that naturally occurring and anthropogenic disturbances affect carbon, causing net sources or sinks for atmospheric CO_2 and CH_4, NASA is interested in proposals to describe and monitor North American disturbance regimes, land-cover and land-use change, climatic variations (e.g., El Niño/Southern Oscillation events) and the impacts of these on terrestrial and coastal ocean carbon stocks and fluxes. Proposals to use high-resolution satellite observations (e.g., observations from Landsat; EO-1; ASTER, MISR, MODIS on Terra and/or Aqua; ICESat; Shuttle Radar Topography Mission; and commercial satellites) as well as proposals to contribute to GOFC-GOLD in this regard are of particular interest.

A major challenge for the NACP is to relate *in situ* measurements and experiments to information contained in local measurements and understanding of detailed processes derived from experiments and process studies. NASA and USDA-CSREES request proposals to address this local to continental scaling problem for North American carbon. DOE is interested in proposals that focus on this issue to enhance the AmeriFlux network capability and/or facility for carbon flux measurement and analysis of regional carbon budgets.

NASA also is interested in proposals to address NACP questions and measurement objectives by using previously collected airborne or space-borne remote sensing data. A preliminary airborne campaign for NACP conducted during the summer of 2003 made observations over a number of U.S. and Canadian ecological research sites and regions of specific interest to NACP (http://www.lbaeco.org/NACS/index.htm). This campaign included aircraft measurements of CO_2 and other atmospheric constituents by the CO_2 Budget and Regional Airborne (COBRA) Study (http://www.fas.harvard.edu/~cobra/). Investigations to make use of these complementary data sets as well as other relevant airborne or space-borne data are encouraged.

USDA-CSREES solicits proposals addressing the contributions of North American agriculture, forestry, and land-use and land-cover change to greenhouse gas fluxes; CO_2, CO, and CH_4 are of particular interest. USDA-CSREES is also interested in proposals to investigate carbon storage and exchange within North American agricultural, silvicultural, and rangeland systems. Predictive model results that inform policies regarding carbon in agricultural and forestry sectors are of interest. Projects that coordinate with observational and experimental facilities such as NSF Long-Term Ecological Research (LTER) sites, Free-Air CO_2 Enrichment (FACE) experiments, AmeriFlux, AgriFlux, and FLUXNET sites, as well as those established by NACP field campaigns are particularly encouraged.

The NACP will conduct intensive field research and campaigns to test and refine methods and measurements and to investigate specific processes that are significant in carbon sources or sinks. This NRA solicits proposals to contribute to NACP intensive field campaigns using unique NASA, DOE, or USDA-CSREES capabilities or combinations of these capabilities. Planning for these intensives is underway and the latest information about plans and schedules can be found at (http://www.carboncyclescience.gov/).

Investigators participating in projects selected to address NACP topics will be expected to coordinate their projects with others participating in the NACP, including participation in relevant planning meetings and workshops. In some cases, revisions to work plans may be requested to take advantage of related efforts.

2. Global Carbon Cycle Modeling and Analyses

The carbon cycle is an integrated global system, and a complete understanding of changes in atmospheric CO_2 and CH_4 concentrations can only be achieved through study of global carbon sources and sinks and their dynamics. Recent NRAs for interdisciplinary science and scientific analysis of data from the NASA Earth Observing System provided broad opportunities for global carbon cycle modeling and analysis. With this NRA, NASA requests proposals to develop, test, and apply carbon data assimilation and data fusion schemes that incorporate NASA Earth observations (terrestrial, oceanic, and atmospheric) and enable forecasts of changes in atmospheric CO_2 and CH_4 concentrations on short or long time scales with estimates of uncertainty. Assimilation of coastal or ocean margin carbon data into global circulation models is also of interest.

The Orbiting Carbon Observatory (OCO), an Earth System Science Pathfinder mission expected to launch in August, 2007, will provide measurements of column CO_2 at spatial and temporal resolutions that allow more detailed estimation of sources and sinks for atmospheric CO_2 (http://oco.jpl.nasa.gov/). NASA is interested in proposals to prepare the scientific community for analysis of OCO data as well as for observations from other upcoming satellite missions that make measurements relevant to carbon cycle science. Such work might anticipate needs for improved atmospheric transport and inversion models, extended validation activities, or to develop data assimilation and data fusion approaches. Studies to analyze observations from the Atmospheric Infrared Sounder (AIRS) on the Aqua satellite in order to retrieve first-order estimates of atmospheric total column CO_2 concentrations are of interest. Proposals should seek to complement, not duplicate, work undertaken by instrument science teams.

3. Regional Studies to Reduce Major Uncertainties about the Carbon Cycle

Although this NRA emphasizes the NACP and global carbon cycling, NASA will also consider proposals for carbon cycle studies in regions outside of North America where critical understanding can be achieved to reduce major uncertainties about the global carbon cycle and where unique NASA capabilities are essential. Proposals for regional investigations should focus on regions and on carbon cycling processes that can cause significant changes in atmospheric CO_2 or CH_4 concentrations or in the size and longevity of important carbon sources and sinks. Such studies must take advantage of unique NASA capabilities and/or make

substantial use of remote sensing observations available from other U.S. sources (e.g., commercial data purchase).

NASA is interested especially in carbon cycle research that responds to the objectives of the Northern Eurasia Earth Science Partnership Initiative (NEESPI) to develop a better understanding of the interactions between the ecosystems, atmosphere and human dynamics in Northern Eurasia (http://neespi.gsfc.nasa.gov/). This NRA requests proposals to use satellite remote sensing to characterize the spatial and temporal distributions of major carbon stocks and fluxes in various ecosystems of Northern Eurasia, including coastal areas. Of particular interest are studies to quantify the response of carbon dynamics to changes in land use, land cover, and climate. Collaboration with scientists in Northern Eurasia on the integration of remote sensing data with other complementary information is encouraged.

NASA is interested in studies that address the topics of this NRA while contributing to GOFC-GOLD by: (1) enhancing existing GOFC regional networks for forest monitoring; (2) developing regional to global maps of rapid land-use and land-cover change, including changes in land cover due to fires, and quantifying rates of land-cover change; and (3) developing integrated land-use and land-cover change detection strategies that enable accurate and cost-effective change detection of regional significance.

Regional oceanic remote sensing studies should seek to understand the mechanisms that control major changes in aquatic carbon sources, sinks, and transport processes and the associated implications for the Earth system. A major area of uncertainty is in the critical role of the "biological pump" in the export of carbon from surface waters into the deep ocean. Topics may include, but are not limited to, quantifying the location, magnitude, and variability of sources, sinks, and transport processes for carbon based on land-use patterns and associated changes; the magnitudes, spatial patterns, and variability of regional air-sea CO_2 fluxes; processes that are responsible for variability in marine primary productivity; and major physical, chemical, and biological feedback processes for ocean carbon storage. An understanding of the errors associated with measurement and quantification must accompany these research results.

All regional studies proposed in response to this NRA should make substantial use of remote sensing data. High-resolution remote sensing observations (e.g., observations from Landsat; EO-1; ASTER, MISR, MODIS on Terra and/or Aqua; ICESat; Shuttle Radar Topography Mission; and commercial satellites) should be of particular value for these studies. Innovative proposals to develop methods for making best use of Landsat 7 data affected by the malfunction of the sensor's scan line corrector are of interest.

4. Carbon Management

Effective carbon management to mitigate increases in atmospheric CO_2 and CH_4 requires decision support systems for developing management strategies and for policy formulation as well as capabilities for monitoring and operational management of carbon stocks and fluxes in terrestrial and marine environments (http://www.eia.doe.gov/oiaf/1605/policy.html). Both NASA and DOE are interested in proposals to address these requirements, particularly within the context of the NACP. Research to incorporate scientific results, observations, and model results

into decision support tools is of interest. Proposals should address calibration, validation, and verification, as appropriate, and seek evaluation by operational organizations.

Proposals to monitor carbon stocks and fluxes for carbon management should address the specific requirements of agencies and enterprises charged with developing and implementing carbon sequestration or management plans and practices. The strategic plans under development for the U.S. Climate Change Technology Program (CCTP) provide guidance for those proposing carbon-monitoring research (http://www.climatescience.gov/about/nccti.htm). Measurement of regional sources and sinks for carbon within North America is a central objective of the NACP and proposals to extend the results of this aspect of NACP as they develop into operational monitoring systems are of interest.

Routine, sustained use of NASA observations, data products, Earth system component model outputs, or systems engineering in the decision support tools or systems employed by an operational entity to meet its mandated responsibilities to support policy or management decisions is a measure of success for the Applications Division's carbon management tasks.

IV. RELATED OPPORTUNITIES

The ESE will soon release an NRA for Oceans and Ice research that provides opportunities for complementary investigations on remote sensing of phytoplankton, primary productivity, coastal processes, and biogeochemical cycling in the ocean (http://research.hq.nasa.gov/code_y/code_y.cfm). NASA's research on ocean biology and biogeochemistry requires close coordination with research in physical oceanography and carbon cycling. Together, the Carbon Cycle Science and Oceans and Ice NRAs call for proposals to address this need. Investigators interested in proposing research to understand the role of the ocean in carbon cycling and focused on achieving the goals of the NACP or on study of the integrated carbon cycle, either globally or regionally, should propose to this Carbon Cycle Science NRA. Investigators interested in proposing research on the measurement of ocean color, to analyze oceanic primary productivity, or to study biogeochemical cycles other than that of carbon, without applying their analyses to the resolution of carbon cycle science questions, should propose to the Oceans and Ice NRA.

V. GUIDANCE FOR PROPOSERS

A. Topics

Proposals are requested within one or more of the following topical areas:

1. The North American Carbon Program
2. Global Carbon Cycle Modeling and Analyses
3. Regional Studies to Reduce Major Uncertainties about the Carbon Cycle
4. Carbon Management

Specific interests in each topic are described above in Section III. Respondents should specify the topic(s) addressed on the proposal cover page and in the proposal abstract.

B. Level of Funding Available

Approximately $36 million is available over a three-year period for research in the carbon cycle science areas solicited above. DOE plans to provide up to $3 million toward this total with the typical annual budget for a project not to exceed $200,000. USDA-CSREES plans to provide $2 million with the typical annual budget for a project not to exceed $200,000. Recognizing the interdisciplinary nature of carbon cycle science and interest in both regional and global scales, NASA will consider a wide range of study sizes. The annual budget for a project should not exceed $500,000. Only the most critical projects with broad scope should propose budgets at this maximum level. The typical annual budget for a project is expected to be $150,000 – $300,000.

FY 2004 USDA support for this Carbon Cycle Science NRA is authorized under the National Research Initiative (NRI), 7 U.S.C. 450i. The NRI Competitive Grants Program supports research grants addressing key problems of national and regional importance to agriculture, forestry, and related sciences. The carbon cycle is a key component to the sustainability of U.S. agriculture, forestry, and environmental health.

Funds are not currently available for awards under this solicitation. The Government's obligation to make award(s) is contingent upon the availability of appropriated funds from which payment can be made and the receipt of proposals that NASA, DOE, or USDA determine are acceptable for award under this NRA.

C. Commercially Available Data Sets

NASA's Earth Science Enterprise has adopted commercial data purchases as a mainstream means of acquiring research-quality data, as these commercial capabilities become available. NASA encourages the use of commercially available data sets by principal investigators as long as these data meet scientific requirements and are cost effective. When responding to a NASA Research Announcement, the respondent should identify the commercial data sources intended for use and the associated cost.

D. Eligibility

Participation in this carbon cycle science research opportunity is open to all categories of domestic and foreign organizations, including educational institutions, industry, non-profit institutions, NASA research centers, and other government agencies and laboratories (including Federally Funded Research and Development Centers).

Participation by non-U.S. institutions must be proposed within the specific guidelines described in Appendix B, sections (l) and (m), which include a no-exchange-of-funds provision. Projects awarded to non-U.S. institutions will be on a no-exchange-of-funds basis; however, investigators involved will have full access to all observations obtained by NASA.

E. Proposal Submission and Review

Notice of Intent to Propose

All prospective proposers are requested to submit a notice of intent (NOI) to propose in response to this announcement by no later than February 11, 2004. This NOI will be used to plan for peer review. Respondents are strongly encouraged to submit their NOI electronically by following the instructions in Appendix F. If this is not possible, NASA will accept a FAX copy containing the information described in Appendix F and sent to (202) 479-0511.

Proposal Content and Format

The proposal should be self-contained and should not refer reviewers to external sources or web sites for critical information. The technical part of the proposal is limited to 18 pages of text, single-spaced, with type no smaller than 12 pt. Proposals that address Carbon Management (Topic 4) in addition to another topic(s) may include 3 additional pages, single-spaced, 12-pt type. Details on the proposal format, content, and order of materials are provided in Appendices A and B. Respondents are urged to read the information in these appendices carefully and to follow the specific guidelines.

Period of Performance

Proposals will be considered for periods of performance of up to three years unless Topic 4 (Carbon management) is addressed in conjunction with any combination of Topics 1–3 and additional time is required to develop the carbon management application.

Proposals that address Topic 4 (Carbon Management) in conjunction with any combination of Topics 1–3, may propose periods of performance of up to five years. To be considered for performance periods greater than three years, research on Topics 1–3 should be organized within the first three project years. Work on carbon management (Topic 4) should be organized within up to two additional years of effort. At the end of three years, NASA will evaluate progress and plans for applications in carbon management to ensure that research objectives for the first three years of effort have been met and that research is sufficiently mature to enable work on the carbon management objectives of the proposal during an additional period of effort.

NASA will use the evaluation criteria for carbon management listed in Appendix A, Section III to evaluate plans for the additional period of effort beyond three years.

All projects selected for awards will be required to submit annual progress reports and will be subject to annual review within the sponsoring agency or agencies.

Projects may be partially funded within fiscal years (i.e., incremental funding) to minimize uncosted carry over.

Review and Selection Process

Proposals will be evaluated by peer review that may include mail review, a panel review, or both. All proposals will be submitted to the NASA peer review process in accordance with the guidelines provided in this NRA. NASA, DOE, and USDA-CSREES will collaborate in the planning and conduct of peer review. This peer review will be followed by a programmatic review in which NASA, DOE, and USDA-CSREES managers will assess program balance across the competitive range of proposals, evaluate any logistical, implementation, cost, and/or management concerns, and identify the agency or combination of agencies best suited to funding the proposals recommended for awards. The funding recommendations will be forwarded to each participating agency's selecting official for confirmation. NASA then will announce the official selection of proposals for award, recognizing the agency or agencies that have agreed to be responsible for funding. Proposals that DOE and USDA have agreed to be responsible for will be forwarded to that agency for final negotiations and implementation of awards.

The evaluation criteria for proposal review, including criteria specific to proposals that address Carbon Management (Topic 4), are listed in Appendix A. Final decisions will be made promptly, and proposers will be notified either by electronic mail or surface mail, or both.

Proposal Submission Dates

Proposals may be submitted at any time during the period ending at 4:30 p.m., EST, on April 7, 2004.

A complete schedule for this opportunity is given below:

Notice of Intent to propose due:	4:30 p.m., EST, February 11, 2004
Proposals due:	4:30 p.m., EDT, April 7, 2004
Peer Review:	May, 2004
Announcement of Final Selections:	June, 2004

F. Additional Information

Appendix A provides guidance specific to this carbon cycle science opportunity and amends the general guidelines for responding to NASA Research Announcements contained in Appendix B. Instructions for foreign participation in this opportunity are included in Appendix B. Appendix A also describes the required proposal content and format as well as proposal evaluation criteria. Appendix C contains information about the required proposal cover sheet and a sample. The cover sheet provides for the required institutional declarations contained in Appendix D. Appendix E contains the NASA budget summary form and instructions. Appendix F provides instructions for electronic submission of notices of intent to propose. If electronic access is not available to prospective proposers, a hard copy of relevant documents can be requested by calling (202) 358-3552 and leaving a voice-mail message. Please leave your full name and address, including zip code, and your telephone number, including area code. *Prospective*

investigators are urged to read the information in all of the appendices carefully and to follow completely the specific guidelines therein.

USDA-CSREES is requesting comments regarding this Request for Applications (RFA) from any interested party. These comments will be considered in the development of subsequent USDA-CSREES RFAs. Such comments will be used to meet the requirements of section 103(c)(2) of the Agricultural Research, Extension, and Education Reform Act of 1998 (7 U.S.C. 7613(c)(2)). This section requires the Secretary of Agriculture to solicit and consider input on a current RFA from persons who conduct or use agricultural research, education and extension for use in formulating future RFA's for competitive programs. Comments should be submitted as provided to Dr. Nancy Cavallaro (see contact information below).

This program is listed in the Catalog of Federal Domestic Assistance under 10.206, National Research Initiative Competitive Grants Program, Carbon Cycle Science.

The following items apply only to this announcement.

Identifier:	NRA-04-OES-01
Submit Proposals to:	Carbon 2004 NASA Peer Review Services, Code Y 500 E Street, SW Suite 200 Washington, DC 20024-2760

For overnight mail delivery purposes only, the recipient telephone number is (202) 479-9030.

Number of Copies Required:	20
NASA Selecting Officials:	Director, Research Division Office of Earth Science Director, Applications Division Office of Earth Science
DOE Selecting Official:	Director Office of Biological and Environmental Research
USDA Selecting Official:	Research Director Competitive Programs

Obtain Additional Information from:

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Finally, prospective respondents are advised that safety is a top priority for all of NASA's programs. Safety is the freedom from those conditions that can cause death, injury, occupational illness, damage to or loss of equipment or property, or damage to the environment. NASA's safety priority is to protect: (1) the public, (2) astronauts and pilots, (3) the NASA work force (including employees working under NASA award instruments), and (4) high-value equipment and property.

Your interest and cooperation in participating in this opportunity are appreciated.

Ghassem R. Asrar
Associate Administrator for
Earth Science

Enclosures:
Appendix A - Amendatory Guidance to the General Guidelines Contained in Appendix B and Applicable Only to this NRA and Instructions for Proposers
Appendix B - Instructions for Responding to NASA Research Announcements
Appendix C - Required Proposal Cover Page
Appendix D - Proposal Cover Page, Assurance of Compliance, and Certifications
Appendix E - Budget Summary Sheet and Instructions
Appendix F - Notice of Intent to Propose

APPENDIX A

AMENDATORY GUIDANCE TO THE GENERAL GUIDELINES CONTAINED IN APPENDIX B AND APPLICABLE ONLY TO THIS NRA AND INSTRUCTIONS FOR PROPOSERS

I. PURPOSE

These guidelines contain general and specific information regarding the submission of proposals in response to this NASA Research Announcement (NRA). Formats and procedures for submission of proposals are provided, and evaluation criteria are specified. Appendix B contains general instructions for responding to NRAs. Where conflicts exist between this appendix and Appendix B, this appendix shall be the controlling document.

II. PROPOSAL CONTENT AND FORMAT

The proposal should provide sufficient detail to enable a reviewer to assess the value of the proposed research, its relation to the objectives of the NRA, and the probability that the investigators will be able to accomplish the stated objectives within the requested resources and schedule. Capabilities of the proposing organizations should be described, including the qualifications and experience of the principal investigator and any co-investigators. The technical part of the proposal is limited to the equivalent of 18 pages of text, single-spaced, with type no smaller than 12 pt. Proposals that address Carbon Management (Topic 4) in addition to another topic(s) may include 3 additional pages, single-spaced, 12-pt type. A reasonable number of figures and tables (not to exceed 4 pages) may be appended. Short resumes, no more than 1–2 pages per investigator, and statements of current and pending research funding (including proposal name, funding agency, duration, and total funding) for all investigators should be included. The cover sheet, table of contents, abstract, list of references, management plan, cost plan, resumes, and statements of current and pending funding need not count in the 18- or 21-page limits. The proposal should be self-contained and should not refer reviewers to external sources or web sites for critical information. If color is used, proposers should ensure that all copies have color. To facilitate recycling, proposals should not be bound or in covers.

A. Page Limits

Offerors must adhere to the following page limits:

Cover Letter	1
Cover Page	1–2
Table of Contents	1
Abstract	1
Technical Plan	18 (21)
List of References	1–4
Management Plan	1/2–2
Cost Plan	3–8

Current and Pending Research	1–2 per investigator
Resumes	1– 2 per investigator
Other	As few as possible

B. Content

Each proposal should contain the following materials assembled in the order given.

1. Cover Letter. Each proposal should be prefaced by a cover letter signed by an official of the investigator's institution who is authorized to legally bind the organization to the proposal and its content (unless the signature appears on the proposal itself). The cover letter should refer to the Carbon 2004 NRA.

2. Proposal Cover Page. Please see Appendices C and D. The topical area(s) addressed by the proposal should be indicated on the cover page.

3. Table of Contents. A table of contents listing the page numbers for key sections of the proposal, including the cost and management plans, should be provided.

4. Abstract (length must not exceed 1 page). The abstract should summarize the proposed research in one page or less. It should list principal investigators and co-investigators, state the topic area(s) from this NRA addressed, and contain a simple, concise overview of the investigation. The overview should state the proposed investigation's objectives, scientific approach, expected results, and the value of those results to NASA, DOE, or USDA-CSREES carbon cycle science activities. It is very important that this abstract be specific and accurately represent the research to be conducted.

5. Technical Plan (length must not exceed 18 or 21 pages). The main body of the proposal should contain a full statement of the research to be undertaken and should describe key background, objectives, scientific relevance, technical approach, and expected significance of the work. The key elements of the project should be clearly identified and related to each other. The methods or approaches to be used should be described, and as appropriate, the advantages of the selected methods or approaches over alternatives should be discussed. The anticipated results should be identified, and their relation to the proposal's stated objectives and NASA, DOE, or USDA-CSREES objectives as outlined in this NRA should be discussed. The research should be described in sufficient detail to allow peer reviewers to adequately assess the scientific methods and quality of the work proposed. Where resources from satellites or other data sources (e.g., aircraft sensors) are required, proposals should indicate whether a commitment has been made for access to the other systems or whether the required or desired data are available. The budget should include the costs for such data. The technical plan should also describe how any data products to be created or additional, ancillary data sets to be obtained will be shared with NASA, DOE, USDA, other investigators, and the broader scientific and user communities.

6. References (1–4 pages). A complete list of references cited in the technical plan must be provided. Each reference should include the title, names of all authors, book or journal title, volume number, page numbers, and year of publication. While it is important to be concise,

proposers should follow accepted scholarly practices in providing citations for source materials relied upon when preparing any section of the proposal.

7. Management Plan (length: 1/2–2 pages, depending on complexity). The Management Plan should outline the roles and responsibilities of all investigators and collaborators and indicate the relationships among these roles and responsibilities within the group. The management plan should also identify what contractor and/or non-institutional support is anticipated and who will provide it. A schedule for reporting results and publishing papers should be described.

8. Cost Plan for U.S. Proposals Only. Please see Appendix B for specific guidance and Appendix E for summary forms. Contributions from any cost-sharing plan or other support for the proposed research should be detailed.

Costs for the acquisition, purchase, storage, or processing of all required data should be included. Also, costs for modeling, if proposed, should include all aspects of the process from writing software through computer operations and time. If use of NASA, DOE, USDA, or other supercomputer resources is anticipated, an estimate of computational requirements and their costs should be included as part of the budget submission. Full costs for the purchase of data from commercial sources should be included in the budget, and the requirement should be documented in the technical plan.

To insure adequate communications between investigators, proposers should request funds for two carbon cycle science meetings of three days duration and located in the U.S. during the course of their research.

As prescribed by section 1462 of the National Agricultural Research, Extension, and Teaching Policy Act of 1977 (7 U.S.C. 3310), USDA-CSREES limits indirect cost rates to 19% of total Federal funding for applicable direct costs. Awards by CSREES through this NRA for carbon cycle science are subject to this 19% limit on indirect costs. This limitation also applies to the recovery of indirect costs through any sub-award or subcontract, and sub-recipient budgets should reflect this limitation. If USDA-CSREES funds a project through this NRA, the indirect cost rate will be adjusted to a maximum of 19%, and the award level will be adjusted accordingly. To accommodate the USDA-CSREES limit on indirect costs, applicants may be required at the time of award to submit a revised budget. Institutions that are unable to accept the USDA-CSREES limit on indirect costs should so state in the proposal cover letter and in the budget explanation section of the proposal (Appendix E). Proposals by such institutions will not be considered for USDA-CSREES funding through this NRA.

9. Summary of Current and Pending Funding. Provide a list of current and pending research funding to include the proposal name, funding agency, duration of research project, and total funding level for all investigators.

10. Resumes. Brief resumes (1–2 pages each) for all named investigators should be appended to the proposal. Respondents should list investigators with whom they have conflicts of interest for peer review purposes. Persons with whom a respondent will have a conflict of interest include, but are not limited to, family members, close collaborators, recent co-authors, major advisors for

recently awarded degrees, and any party to or member of an organization with whom the respondent has a financial interest.

11. Other Enclosures. Proposers may include other materials such as preprints or reprints of relevant publications, background on new measurement or analysis approaches, or letters of support and/or participation by scientists and/or institutions. Such materials are considered ancillary. Information in the Technical Plan of the proposal should stand alone. Other materials will not be evaluated.

C. Additional Requirements for Proposals that Address Carbon Management

In addition to the requirements for proposals described above, proposals that address Topic 4, Carbon Management, should include the following:

1. Description of Partners: Identify partner organizations committed to using the decision support tools and systems in their operational procedures. Letters of support from the partner organizations are strongly encouraged.

2. Description of Tools or Systems: Include descriptions of existing decision support tools, systems, or processes that would be addressed by the proposed project.

3. Importance of the Solution: Indicate the impact the proposed project would have on carbon management policies and/or procedures.

4. Financial Commitment: Describe the level and nature of financial support for the proposal from partner, user organizations.

5. Metrics: Include a description of criteria for evaluation of the impact of the proposed project on the partner, user organization.

6. Plan for Post-Project Activity: Include a plan for post-project operational support of the tools, systems, etc., by the user partner.

III. SELECTION PROCESS AND EVALUATION CRITERIA

The review of proposals submitted under this NRA will consist of a full peer review including external reviewers, which may involve a mail review, a panel review, or both.

A. Evaluation Criteria.

The criteria listed below will be used in evaluating individual proposals. These three criteria supersede those listed in section (i) of Appendix B and are of approximately equal importance.

1. The intrinsic merits of the investigation, including:

   (a) the overall scientific or technical merit of the proposal or unique and innovative methods, approaches, or concepts demonstrated by the proposal.

   (b) the qualifications, capabilities, and relevant experience of the principal investigator and any co-investigators or collaborators as an indication of their ability to carry the investigation to a successful conclusion within the requested resources, including timely publication of peer-reviewed journal articles.

   (c) the adequacy of facilities and ability and commitment of the investigator's institution to provide the necessary support to ensure that the investigation can be completed satisfactorily.

   (d) TO BE APPLIED ONLY TO THOSE PROPOSALS THAT ADDRESS CARBON MANAGEMENT (TOPIC 4):

      (1) Partnership opportunity: Identification of a partner or partners among U.S. federal agencies, state and local governments, commercial enterprises or non-government organizations that have operational responsibility for carbon management or input into carbon management policy.

      (2) Appropriate tools and systems: Identification of specific decision support tools or systems, currently in use or under development by the partner organization that will benefit from the task.

      (3) Impact of the solution: The extent to which the management solution will have a national impact. Local/regional solutions are acceptable if shown to be extendable nationally or beyond.

      (4) Plan for post-project activity: The likelihood that the partner organization will provide on-going support to the process after the conclusion of the award period.

      (5) Unique NASA capabilities: Use of NASA unique observation and prediction capabilities in the decision support tools and systems.

2. The relevance and responsiveness of the proposed research to:

   (a) the goals and objectives of NASA ESE, DOE, or USDA-CSREES.

   (b) the goals, objectives, and topical areas described in this NRA.

3. The cost of the investigation, including consideration of the realism and reasonableness of the proposed cost, the relationship of the proposed cost to

available funds, and the potential value of the validation approach(es) (i.e., cost/benefit) to the user community.

B. Other Considerations

NASA, DOE, and USDA reserve the right to select and make an award covering only a portion of a proposer's investigation, in which case the investigator will be given the opportunity to accept or decline such partial acceptance. In cases in which two or more proposals address similar problems and/or adopt similar approaches to data analysis, NASA, DOE, or USDA may desire joint participation on the part of two or more proposers in a single project. If such overlap involves more than one funding organization, NASA, DOE, and/or USDA and those organizations will confer and mutually agree to the disposition of those proposals.

Respondents selected for funding by DOE or by USDA-CSREES may be asked to submit additional documentation to satisfy DOE or USDA-CSREES funding compliance and certification requirements. Proposals selected for funding by USDA-CSREES will be asked to comply with the USDA 19% limit on indirect cost rates (see Appendix A, Section II.B.8 for details).

Final decisions will be made promptly and investigators will be notified by either electronic mail or surface mail, or both.

APPENDIX B

INSTRUCTIONS FOR RESPONDING TO NASA RESEARCH ANNOUNCEMENTS (1852.235-72, OCTOBER 2002)

(a) **General.**

(1) Proposals received in response to a NASA Research Announcement (NRA) will be used only for evaluation purposes. NASA does not allow a proposal, the contents of which are not available without restriction from another source, or any unique ideas submitted in response to an NRA to be used as the basis of a solicitation or in negotiation with other organizations, nor is a pre-award synopsis published for individual proposals.

(2) A solicited proposal that results in a NASA award becomes part of the record of that transaction and may be available to the public on specific request; however, information or material that NASA and the awardee mutually agree to be of a privileged nature will be held in confidence to the extent permitted by law, including the Freedom of Information Act.

(3) NRAs contain programmatic information and certain requirements that apply only to proposals prepared in response to that particular announcement. These instructions contain the general proposal preparation information that applies to responses to all NRAs.

(4) A contract, grant, cooperative agreement, or other agreement may be used to accomplish an effort funded in response to an NRA. The NASA contracting officer will determine the appropriate award instrument. Contracts resulting from NRAs are subject to the Federal Acquisition Regulation and the NASA FAR Supplement. Any resultant grants or cooperative agreements will be awarded and administered in accordance with the NASA Grant and Cooperative Agreement Handbook (NPG 5800.1).

(5) NASA does not have mandatory forms or formats for responses to NRAs; however, it is requested that proposals conform to the guidelines in these instructions. NASA may accept proposals without discussion; hence, proposals should initially be as complete as possible and be submitted on the proposers' most favorable terms.

(6) To be considered for award, a submission must, at a minimum, present a specific project within the areas delineated by the NRA; contain sufficient technical and cost information to permit a meaningful evaluation; be signed by an official authorized to legally bind the submitting organization; not merely offer to perform standard services or to just provide computer facilities or services; and not significantly duplicate a more specific current or pending NASA solicitation.

(b) **NRA-Specific Items.** Several proposal submission items appear in the NRA itself: the unique NRA identifier; when to submit proposals; where to send proposals; number of copies required; and sources for more information. Items included in these instructions may be supplemented by the NRA.

(c) The following information is needed to permit consideration in an objective manner. NRAs will generally specify topics for which additional information or greater detail is desirable. Each proposal copy shall contain all submitted material, including a copy of the transmittal letter if it contains substantive information.

(1) **Transmittal Letter or Prefatory Material.**

(i) The legal name and address of the organization and specific division or campus identification if part of a larger organization;

(ii) A brief, scientifically valid project title intelligible to a scientifically literate reader and suitable for use in the public press;
(iii) Type of organization: e.g., profit, nonprofit, educational, small business, minority, women-owned, etc.;
(iv) Name and telephone number of the principal investigator and business personnel who may be contacted during evaluation or negotiation;
(v) Identification of other organizations that are currently evaluating a proposal for the same efforts;
(vi) Identification of the NRA, by number and title, to which the proposal is responding;
(vii) Dollar amount requested, desired starting date, and duration of project;
(viii) Date of submission; and
(ix) Signature of a responsible official or authorized representative of the organization, or any other person authorized to legally bind the organization (unless the signature appears on the proposal itself).

(2) **Restriction on Use and Disclosure of Proposal Information.** Information contained in proposals is used for evaluation purposes only. Offerors or quoters should, in order to maximize protection of trade secrets or other information that is confidential or privileged, place the following notice on the title page of the proposal and specify the information subject to the notice by inserting an appropriate identification in the notice. In any event, information contained in proposals will be protected to the extent permitted by law, but NASA assumes no liability for use and disclosure of information not made subject to the notice.

Notice
Restriction on Use and Disclosure of Proposal Information

The information (data) contained in [insert page numbers or other identification] of this proposal constitutes a trade secret and/or information that is commercial or financial and confidential or privileged. It is furnished to the Government in confidence with the understanding that it will not, without permission of the offeror, be used or disclosed other than for evaluation purposes; provided, however, that in the event a contract (or other agreement) is awarded on the basis of this proposal the Government shall have the right to use and disclose this information (data) to the extent provided in the contract (or other agreement). This restriction does not limit the Government's right to use or disclose this information (data) if obtained from another source without restriction.

(3) **Abstract.** Include a concise (200-300 word if not otherwise specified in the NRA) abstract describing the objective and the method of approach.

(4) **Project Description.**

(i) The main body of the proposal shall be a detailed statement of the work to be undertaken and should include objectives and expected significance; relation to the present state of knowledge; and relation to previous work done on the project and to related work in progress elsewhere. The statement should outline the plan of work, including the broad design of experiments to be undertaken and a description of experimental methods and procedures. The project description should address the evaluation factors in these instructions and any specific factors in the NRA. Any substantial collaboration with individuals not referred to in the budget or use of consultants should be described. Subcontracting significant portions of a research project is discouraged.

(ii) When it is expected that the effort will require more than one year, the proposal should cover the complete project to the extent that it can be reasonably anticipated. Principal emphasis should be on the first year of work, and the description should distinguish clearly between the first year's work and work planned for subsequent years.

(5) **Management Approach.** For large or complex efforts involving interactions among numerous individuals or other organizations, plans for distribution of responsibilities and arrangements for ensuring a coordinated effort should be described.

(6) **Personnel.** The principal investigator is responsible for supervision of the work and participates in the conduct of the research regardless of whether or not compensated under the award. A short biographical sketch of the principal investigator, a list of principal publications and any exceptional qualifications should be included. Omit social security number and other personal items, which do not merit consideration in evaluation of the proposal. Give similar biographical information on other senior professional personnel who will be directly associated with the project. Give the names and titles of any other scientists and technical personnel associated substantially with the project in an advisory capacity. Universities should list the approximate number of students or other assistants, together with information as to their level of academic attainment. Any special industry-university cooperative arrangements should be described.

(7) **Facilities and Equipment.**

(i) Describe available facilities and major items of equipment especially adapted or suited to the proposed project, and any additional major equipment that will be required. Identify any Government-owned facilities, industrial plant equipment, or special tooling that are proposed for use. Include evidence of its availability and the cognizant Government points of contact.

(ii) Before requesting a major item of capital equipment, the proposer should determine if sharing or loan of equipment already within the organization is a feasible alternative. Where such arrangements cannot be made, the proposal should so state. The need for items that typically can be used for research and non-research purposes should be explained.

(8) **Proposed Costs (U.S. Proposals Only).**

(i) Proposals should contain cost and technical parts in one volume: do not use separate "confidential" salary pages. As applicable, include separate cost estimates for salaries and wages; fringe benefits; equipment; expendable materials and supplies; services; domestic and foreign travel; ADP expenses; publication or page charges; consultants; subcontracts; other miscellaneous identifiable direct costs; and indirect costs. List salaries and wages in appropriate organizational categories (e.g., principal investigator, other scientific and engineering professionals, graduate students, research assistants, and technicians and other non-professional personnel). Estimate all staffing data in terms of staff-months or fractions of full-time.

(ii) Explanatory notes should accompany the cost proposal to provide identification and estimated cost of major capital equipment items to be acquired; purpose and estimated number and lengths of trips planned; basis for indirect cost computation (including date of most recent negotiation and cognizant agency); and clarification of other items in the cost proposal that are not self-evident. List estimated expenses as yearly requirements by major work phases.

(iii) Allowable costs are governed by FAR Part 31 and the NASA FAR Supplement Part 1831 (and OMB Circulars A-21 for educational institutions and A-122 for nonprofit

organizations). All proposals involving NASA employees as either PI or as a CO-I must be shown in full cost in accordance with Agency full cost accounting standards (http://www.hq.nasa.gov/fullcost).

(iv) Use of NASA funds—NASA funding may not be used for foreign research efforts at any level, whether as a collaborator or a subcontract (also see paragraph l). The direct purchase of supplies and/or services, which do not constitute research, from non-U.S. sources by U.S. award recipients is permitted. Additionally, in accordance with the National Space Transportation Policy, use of a non-U.S. manufactured launch vehicle is permitted only on a no-exchange-of-funds basis.

(9) **Security.** Proposals should not contain security-classified material. If the research requires access to or may generate security-classified information, the submitter will be required to comply with Government security regulations.

(10) **Current Support.** For other current projects being conducted by the principal investigator, provide title of project, sponsoring agency, and ending date.

(11) **Special Matters.**

(i) Include any required statements of environmental impact of the research, human subject or animal care provisions, conflict of interest, or on such other topics as may be required by the nature of the effort and current statutes, executive orders, or other current Government-wide guidelines. Of particular interest are proposed use of radioactive or hazardous materials or lasers.

(ii) Identify and discuss risk factors and issues throughout the proposal where they are relevant, and your approach to managing these risks.

(iii) Proposers should include a brief description of the organization, its facilities, and previous work experience in the field of the proposal. Identify the cognizant Government audit agency, inspection agency, and administrative contracting officer, when applicable.

(d) **Renewal Proposals.**

(1) Renewal proposals for existing awards will be considered in the same manner as proposals for new endeavors. A renewal proposal should not repeat all of the information that was in the original proposal. The renewal proposal should refer to its predecessor, update the parts that are no longer current, and indicate what elements of the research are expected to be covered during the period for which support is desired. A description of any significant findings since the most recent progress report should be included. The renewal proposal should treat, in reasonable detail, the plans for the next period, contain a cost estimate, and otherwise adhere to these instructions.

(2) NASA may renew an effort either through amendment of an existing contract or by a new award.

(e) **Length and Page Format.** Unless otherwise specified in the NRA, effort should be made to keep proposals as brief as possible, concentrating on substantive material. **Proposals are not to exceed 20 pages**, including references and figures (cover pages, certifications, budget sheets, and attachments are not included in this page limit). Necessary detailed information, such as reprints, should be included as attachments. A complete set of attachments is necessary for each copy of the proposal. As proposals are not returned, avoid use of "one-of-a-kind" attachments.

(f) **Joint Proposals.**

(1) Where multiple organizations are involved, the proposal may be submitted by only one of them. It should clearly describe the role to be played by the other organizations and indicate the legal and managerial arrangements contemplated. In other instances, simultaneous submission of related proposals from each organization might be appropriate, in which case parallel awards would be made.

(2) Where a project of a cooperative nature with NASA is contemplated, describe the contributions expected from any participating NASA investigator and agency facilities or equipment, which may be required. The proposal must be confined only to that which the proposing organization can commit itself. "Joint" proposals, which specify the internal arrangements NASA will actually make, are not acceptable as a means of establishing an agency commitment.

(g) **Late Proposals.** Proposals or proposal modifications received after the latest date specified for receipt may be considered if a significant reduction in cost to the Government is probable or if there are significant technical advantages, as compared with proposals previously received.

(h) **Withdrawal.** Proposals may be withdrawn by the proposer at any time before award. Offerors are requested to notify NASA if the proposal is funded by another organization or of other changed circumstances, which dictate termination of evaluation.

(i) **Evaluation Factors.**

(1) Unless otherwise specified in the NRA, the principal elements (of approximately equal weight) considered in evaluating a proposal are its relevance to NASA's objectives, intrinsic merit, and cost.

(2) Evaluation of a proposal's relevance to NASA's objectives includes the consideration of the potential contribution of the effort to NASA's mission.

(3) Evaluation of its intrinsic merit includes the consideration of the following factors of equal importance:

(i) Overall scientific or technical merit of the proposal or unique and innovative methods, approaches, or concepts demonstrated by the proposal.

(ii) Offeror's capabilities, related experience, facilities, techniques, or unique combinations of these, which are integral factors for achieving the proposal objectives.

(iii) The qualifications, capabilities, and experience of the proposed principal investigator, team leader, or key personnel critical in achieving the proposal objectives.

(iv) Overall standing among similar proposals and/or evaluation against the state-of-the-art.

(4) Evaluation of the cost of a proposed effort may include the realism and reasonableness of the proposed cost and available funds. Cost is of substantially less weight than the other factors combined.

(j) **Evaluation Techniques.** Selection decisions will be made following peer and/or scientific review of the proposals. Several evaluation techniques are regularly used within NASA. In all cases proposals are subject to scientific review by discipline specialists in the area of the proposal. Some proposals are reviewed entirely in-house, others are evaluated by a combination of in-house and selected external reviewers, while yet others are subject to the full external peer review technique (with due regard for conflict-of-interest and protection of proposal information), such as

by mail or through assembled panels. The final decisions are made by a NASA selecting official. A proposal, which is scientifically and programmatically meritorious, but not selected for award during its initial review, may be included in subsequent reviews unless the proposer requests otherwise.

(k) **Selection for Award.**

(1) When a proposal is not selected for award, the proposer will be notified. NASA will explain generally why the proposal was not selected. Proposers desiring additional information may contact the selecting official who will arrange a debriefing.

(2) When a proposal is selected for award, negotiation and award will be handled by the procurement office in the funding installation. The proposal is used as the basis for negotiation. The contracting officer may request certain business data and may forward a model award instrument and other information pertinent to negotiation.

(l) **Additional Guidelines Applicable to Foreign Proposals and Proposals Including Foreign Participation.**

(1) NASA welcomes proposals from outside the U.S. However, foreign entities are generally not eligible for funding from NASA. Therefore, unless otherwise noted in the NRA, proposals from foreign entities should not include a cost plan unless the proposal involves collaboration with a U.S. institution, in which case a cost plan for only the participation of the U.S. entity must be included. Proposals from foreign entities and proposals from U.S. entities that include foreign participation must be endorsed by the respective government agency or funding/sponsoring institution in the country from which the foreign entity is proposing. Such endorsement should indicate that the proposal merits careful consideration by NASA, and if the proposal is selected, sufficient funds will be made available to undertake the activity as proposed.

(2) All foreign proposals must be typewritten in English and comply with all other submission requirements stated in the NRA. All foreign proposals will undergo the same evaluation and selection process as those originating in the U.S. All proposals must be received before the established closing date. Those received after the closing date will be treated in accordance with paragraph (g) of this provision. Sponsoring foreign government agencies or funding institutions may, in exceptional situations, forward a proposal without endorsement if endorsement is not possible before the announced closing date. In such cases, the NASA sponsoring office should be advised when a decision on endorsement can be expected.

(3) Successful and unsuccessful foreign entities will be contacted directly by the NASA sponsoring office. Copies of these letters will be sent to the foreign sponsor. Should a foreign proposal or a U.S. proposal with foreign participation be selected, NASA's Office of External Relations will arrange with the foreign sponsor for the proposed participation on a no-exchange-of-funds basis, in which NASA and the non-U.S. sponsoring agency or funding institution will each bear the cost of discharging their respective responsibilities.

(4) Depending on the nature and extent of the proposed cooperation, these arrangements may entail:

(i) An exchange of letters between NASA and the foreign sponsor**;** or

(ii) A formal Agency-to-Agency Memorandum of Understanding (MOU).

(m) **Export Control Guidelines Applicable to Proposals Including Foreign Participation.** Proposals including foreign participation must include a section discussing compliance with U.S. export laws and regulations, e.g., 22 CFR Parts 120-130 and 15 CFR Parts 730-774, as applicable to the circumstances surrounding the particular foreign participation. The discussion must describe in detail the proposed foreign participation and is to include, but not limited to, whether or not the foreign participation may require the prospective proposer to obtain the prior approval of the Department of State or the Department of Commerce via a technical assistance agreement or an export license, or whether a license exemption/exception may apply. If prior approvals via licenses are necessary, discuss whether the license has been applied for or if not, the projected timing of the application and any implications for the schedule. Information regarding U.S. export regulations is available at http://www.pmdtc.org and http://www.bxa.doc.gov. Proposers are advised that under U.S. law and regulations, spacecraft and their specifically designed, modified, or configured systems, components, and parts are generally considered "Defense Articles" on the United States Munitions List and subject to the provisions of the International Traffic in Arms Regulations (ITAR), 22 CFR Parts 120-130.

(n) **Cancellation of NRA.** NASA reserves the right to make no awards under this NRA and to cancel this NRA. NASA assumes no liability for canceling the NRA or for anyone's failure to receive actual notice of cancellation.

(o) **Data Policy**

NASA's policy is to work cooperatively with other U.S. government agencies and our international partners in the development of a comprehensive capability to observe and understand the Earth. In addition, both National and NASA policy require NASA to support private-sector investment in commercial space activities by committing the U.S. government to purchase commercially available goods and services. NASA will not develop a mission that in any significant way competes with or duplicates commercially available goods or services from U.S. industry.

APPENDIX C

Required Proposal Cover Page

Two steps are required to submit a cover page. The first step is to complete the proposal cover page (see SAMPLE Appendix D) **electronically** to the SYS-EYFUS Website located at http://proposals.hq.nasa.gov/. If the proposer has submitted an electronic Notice of Intent (Appendix F) to SYS-EYFUS, the same user UserID and password can be used to complete the electronic proposal cover page. If the proposer obtained a User ID and password in the process of submitting a proposal for a previous research opportunity announcement, the same user UserID and password can be used to complete the electronic proposal cover page in response to this research opportunity announcement. Be sure to click on "Edit Personal Information" if any of your correspondence information in SYS-EYFUS is not current.

The second step is to print a **hard copy** (see Appendix D) of the electronic cover page that must be signed by the Principal Investigator and an official of the investigator's organization who is authorized to commit the organization. This authorizing signature also certifies that the proposing institution has read and is in compliance with the required certifications printed in full, therefore, these certifications do not need to be submitted separately. This page will not be counted against the page limit of the proposal.

If you do not have a SYS-EYFUS UserID or password, you may obtain one electronically by going to http://proposals.hq.nasa.gov and performing the following steps:

a) Click the hyperlink for **new user** that will take you to the Personal Information Search Page.
b) Enter your first and last name. SYS-EYFUS will **search** for your record information in the SYS-EYFUS database.
c) Confirm your personal information by **choosing** the record displayed.
d) Select **continue**, and a User ID and password will be e-mailed to you.

Once you receive your User ID and Password, **login** to the SYS-EYFUS website and follow the instructions for **New Proposal Cover Page.**

Proposers without access to the web or who experience difficulty in using this site may contact the Help Desk at **proposals@hq.nasa.gov** (or call 202-479-9376) for assistance. After you have submitted your notice of intent or proposal cover page electronically, if you are unsure if it has been successfully submitted, **do not re-submit**. Please call the Help Desk. They will be able to promptly tell you if your submission has been received. Please note that submission of the electronic cover page does not satisfy the deadline for proposal submission.

Proposal Cover Page

Proposal Number: _____

Date: __/___/_____

Name of Submitting Institution: **Congressional District:**

Proposal Title:	
Name of Submitting Institution:	**Congressional Distinct:**

Certification of Compliance with Applicable Executive Orders and US Code

By submitting the proposal identified in this *Cover Sheet/Proposal Summary* in response to this Research Announcement, the Authorizing Official of the proposing institution (or the individual proposer if there is no proposing institution) as identified below:

- certifies that the statements made in this proposal are true and complete to the best of his/her knowledge;
- agrees to accept the obligations to comply with NASA award terms and conditions if an award is made as a result of this proposal; and
- confirms compliance with all provisions, rules, and stipulations set forth in the two Certifications contained in this NRA [namely, (i) *Assurance of Compliance with the NASA Regulations Pursuant to Nondiscrimination in Federally Assisted Programs, and (ii) Certifications, Disclosures, And Assurances Regarding Lobbying and Debarment & Suspension*].

Willful provision of false information in this proposal and/or its supporting documents, or in reports required under an ensuing award, is a criminal offense (U.S. Code, Title 18, Section 1001).

NASA PROCEDURE FOR HANDLING PROPOSALS

This proposal shall be used and disclosed for evaluation purposes only, and a copy of this Government notice shall be applied to any reproduction or abstract thereof. Any authorized restrictive notices that the submitter places on this proposal shall also be strictly complied with. Disclosure of this proposal for any reason outside the Government evaluation purposes shall be made only to the extent authorized by the Government.

Princi Investigator N .:		**Authorized Institutional Official Name:**	
Organiz on:		**Organization:**	
Departm		**Dep ent:**	
Mailing Address:		**M ing A dress:**	
City, State Z		**y, S e Zip:**	
Tele ne Num		**Telep ne N ber:**	
Fax Number:		**Fax N ber:**	
Email Address:		**Email A dress:**	
Principal Investigator Signature:	_____	**Authorized Institutional Official Signature:**	_____
Date:	_____	**Date:**	_____

Co-Investigator:

Name	Telephone	Email	Institution	Address

Budget:

Year	Budget
1	
2	
3	
Total	

APPENDIX D

Assurance of Compliance with the NASA Regulations Pursuant to Nondiscrimination in Federally Assisted Programs

The *(Institution, corporation, firm, or other organization on whose behalf this assurance is signed, hereinafter called "Applicant ")* hereby agrees that it will comply with Title VI of the Civil Rights Act of 1964 (P.L. 88-352), Title IX of the Education Amendments of 1972 (20 U.S.C. 1680 et seq.), Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), and the Age Discrimination Act of 1975 (42 U.S.C. 16101 et seq.), and all requirements imposed by or pursuant to the Regulation of the National Aeronautics and Space Administration (14 CFR Part 1250) (hereinafter called "NASA") issued pursuant to these laws, to the end that in accordance with these laws and regulations, no person in the United States shall, on the basis of race, color, national origin, sex, handicapped condition, or age be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity for which the Applicant receives federal financial assistance from NASA; and hereby give assurance that it will immediately take any measure necessary to effectuate this agreement.

If any real property or structure thereon is provided or improved with the aid of federal financial assistance extended to the Applicant by NASA, this assurance shall obligate the Applicant, or in the case of any transfer of such property, any transferee, for the period during which the real property or structure is used for a purpose for which the federal financial assistance is extended or for another purpose involving the provision of similar services or benefits. If any personal property is so provided, this assurance shall obligate the Applicant for the period during which it retains ownership or possession of the property. In all other cases, this assurance shall obligate the Applicant for the period during which the federal financial assistance is extended to it by NASA.

This assurance is given in consideration of and for the purpose of obtaining any and all federal grants, loans, contracts, property, discounts, or other federal financial assistance extended after the date hereof to the Applicant by NASA, including installment payments after such date on account of applications for federal financial assistance which were approved before such date. The Applicant recognizes and agrees that such federal financial assistance will be extended in reliance on the representations and agreements made in this assurance, and that the United States shall have the right to seek judicial enforcement of this assurance. This assurance is binding on the Applicant, its successors, transferees, and assignees, and the person or persons whose signatures appear on the Proposal Cover Sheet above are authorized to sign on behalf of the Applicant.

CERTIFICATIONS, DISCLOSURES, AND ASSURANCES
REGARDING LOBBYING AND DEBARMENT & SUSPENSION

1. LOBBYING

As required by Section 1352, Title 31 of the U.S. Code, and implemented at 14 CFR Part 1271, as defined at 14 CFR Subparts 1271.110 and 1260.117, with each submission that initiates agency consideration of such applicant for award of a Federal contract, grant, or cooperative agreement exceeding $ 100,000, the applicant must **certify** that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit a Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

2. GOVERNMENTWIDE DEBARMENT AND SUSPENSION

As required by Executive Order 12549, and implemented at 14 CFR 1260.510, for prospective participants in primary covered transactions, as defined at 14 CFR Subparts 1265.510 and 1260.117—

(1) The prospective primary participant **certifies** to the best of its knowledge and belief, that it and its principals:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded by any Federal department or agency;

(b) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (l)(b) of this certification; and

(d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

(2) Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

APPENDIX E

BUDGET SUMMARY

For period from _____ to _____

- Provide a complete Budget Summary for year one and separate estimated for each subsequent year.
- Enter the proposed estimated costs in Column A (Columns B & C for NASA use only).
- Provide as attachments detailed computations of all estimates in each cost category with narratives as required to fully explain each proposed cost. See *Instructions For Budget Summary* on following page for details.

		NASA USE ONLY	
	A	**B**	**C**
1. Direct Labor (salaries, wages, and fringe benefits)	_____	_____	_____
2. Other Direct Costs:			
a. Subcontracts	_____	_____	_____
b. Consultants	_____	_____	_____
c. Equipment	_____	_____	_____
d. Supplies	_____	_____	_____
e. Travel	_____	_____	_____
f. Other	_____	_____	_____
3. Indirect Costs*	_____	_____	_____
4. Other Applicable Costs	_____	_____	_____
5. SUBTOTAL--Estimated Costs	_____	_____	_____
6. Less Proposed Cost Sharing (if any)	_____	_____	_____
7. Carryover Funds (if any)			
a. Anticipated amount : _____			
b. Amount used to reduce budget	_____	_____	_____
8. Total Estimated Costs	_____	_____	XXXXXXX
9. APPROVED BUDGET	XXXXXX	XXXXXXX	_____

***Facilities and Administrative Costs.**

INSTRUCTIONS FOR BUDGET SUMMARY

1. Direct Labor (salaries, wages, and fringe benefits): Attachments should list the number and titles of personnel, amounts of time to be devoted to the grant, and rates of pay.

2. Other Direct Costs:
    a. Subcontracts: Attachments should describe the work to be subcontracted, estimated amount, recipient (if known), and the reason for subcontracting.
    b. Consultants: Identify consultants to be used, why they are necessary, the time they will spend on the project, and rates of pay (not to exceed the equivalent of the daily rate for Level IV of the Executive Schedule, exclusive of expenses and indirect costs).
    c. Equipment: List separately. Explain the need for items costing more than $5,000. Describe basis for estimated cost. General purpose equipment is not allowable as a direct cost unless specifically approved by the NASA Grant Officer. Any equipment purchase requested to be made as a direct charge under this award must include the equipment description, how it will be used in the conduct of the basic research proposed and why it cannot be purchased with indirect funds.
    d. Supplies: Provide general categories of needed supplies, the method of acquisition, and the estimated cost.
    e. Travel: Describe the purpose of the proposed travel in relation to the grant and provide the basis of estimate, including information on destination and number of travelers where known.
    f. Other: Enter the total of direct costs not covered by 2a through 2e. Attach an itemized list explaining the need for each item and the basis for the estimate.

3. Indirect Costs[*]: Identify F&A cost rate(s) and base(s) as approved by the cognizant Federal agency, including the effective period of the rate. Provide the name, address, and telephone number of the Federal agency official having cognizance. If unapproved rates are used, explain why, and include the computational basis for the indirect expense pool and corresponding allocation base for each rate.

4. Other Applicable Costs: Enter total explaining the need for each item.

5. Subtotal-Estimated Costs: Enter the sum of items 1 through 4.

6. Less Proposed Cost Sharing (if any): Enter any amount proposed. If cost sharing is based on specific cost items, identify each item and amount in an attachment.

7. Carryover Funds (if any): Enter the dollar amount of any funds expected to be available for carryover from the prior budget period Identify how the funds will be used if they are not used to reduce the budget. NASA officials will decide whether to use all or part of the anticipated carryover to reduce the budget (not applicable to 2nd-year and subsequent-year budgets submitted for award of a multiple year award).

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[*] Facilities and Administrative (F&A) Costs

8. Total Estimated Costs: Enter the total after subtracting items 6 and 7b from item 5.

APPENDIX F

Notice of Intent to Propose

In order to plan for a timely and efficient peer review process, *Notices of Intent* (NOI's) to propose are strongly encouraged by the date given in this NRA. The submission of a NOI is not a commitment to submit a proposal, nor is information contained therein considered binding on the submitter. NOI's are to be submitted electronically by entering the requested information through SYS-EYFUS Web site located at **http://proposals.hq.nasa.gov/**.

User identifications (IDs) and passwords are required by NASA security policies in order to access the SYS-EYFUS Web site.

If the proposer obtained a User ID and password in the process of submitting a proposal for a previous research opportunity announcement, the same user UserID and password can be used to complete the electronic Notice of Intent to Propose in response to this research opportunity announcement.

If you do not have a SYS-EYFUS UserID or password, you may obtain one electronically by going to http://proposals.hq.nasa.gov and performing the following steps:

e) Click the hyperlink for **new user** which will take you to the Personal Information Search Page.
f) Enter your first and last name. SYS-EYFUS will **search** for your record information in the SYS-EYFUS database.
g) Confirm your personal information by **choosing** the record displayed.
h) Select **continue**, and a User ID and password will be e-mailed to you.

Once you receive your User ID and Password, **login** to the SYS-EYFUS Web site and follow the instructions for **New Notice of Intent.**

At a minimum, the following information will be requested:

- NRA number, alpha-numeric identifier, (Note: this may be included on the Web site template);
- the Principal Investigator's name, mailing address, phone number, and E-mail address;
- the name(s) of any Co-Investigator(s) and institution(s) known by the NOI due date;
- a descriptive title of the intended investigation; and,
- a brief description of the investigation to be proposed.

A separate NOI must be submitted for each intended proposal.